The Greening of Brownfields

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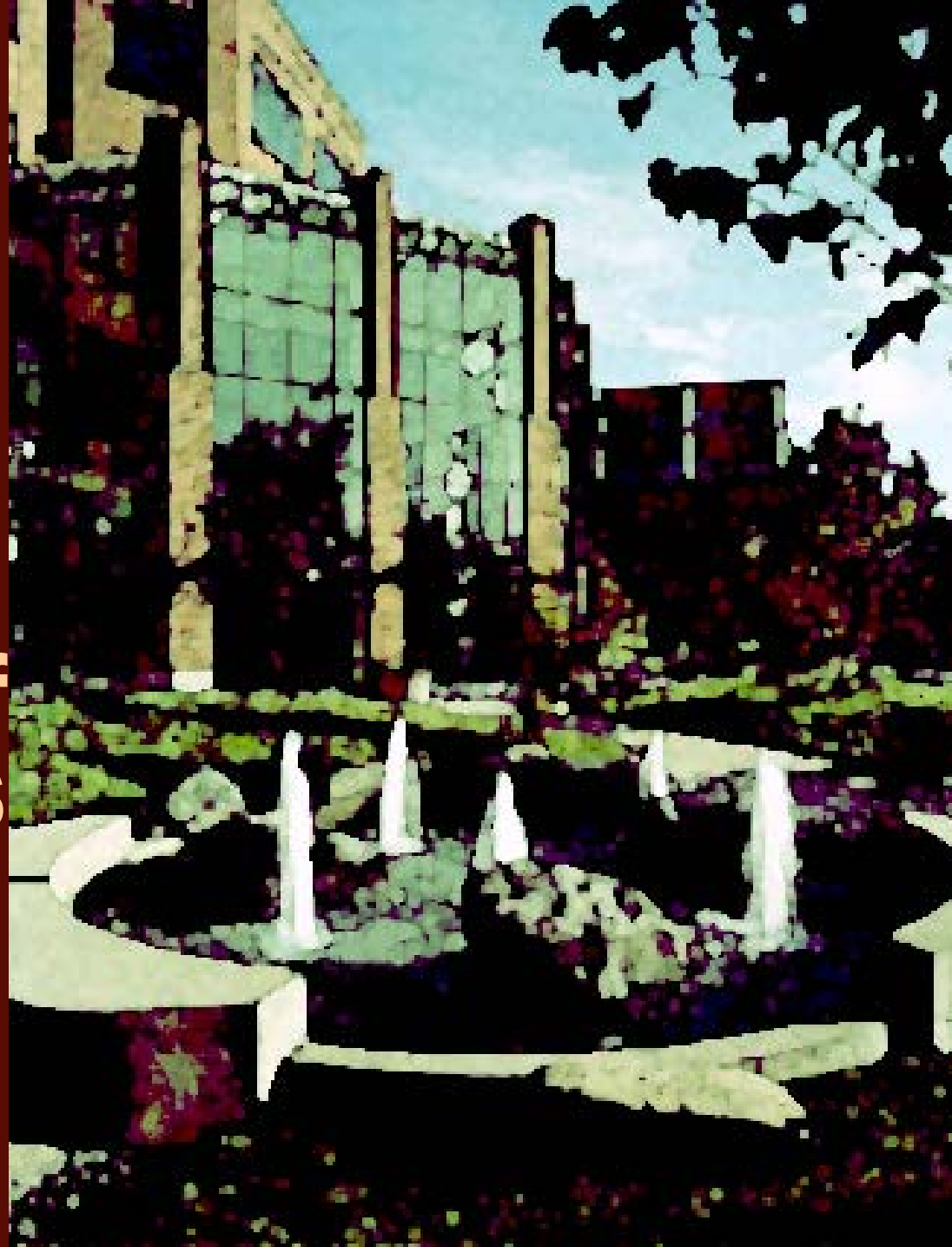


- EPA definition - With certain legal exclusions and additions, “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.”
  - Federal funding program, which excludes “enforcement” sites and military bases
  - Differs from other contaminated sites (i.e., military bases) in financing and liability.
- Est. 600,000 sites nationwide
- Examples: gasoline stations, landfills, oil fields, manufacturing and industrial facilities.

Brownfield?

Before


During


After

Why Redevelop Brownfields?

- Protect public and environment from potential hazards
- Revitalize neighborhoods
- Protect “greenfields” - open space & agricultural land
- Reduce impacts of sprawl
- Reduce impacts to water, air, traffic and community identity
- Optimize use of existing infrastructure
- Create jobs near existing labor pool
- Construct housing in tight housing market
- Expand tax base (property, business and sales)

Brownfields Uncertainties

- Cost - *What will I have to spend for cleanup and assessment costs?*
- Legal - *Who's responsible for past and residual contamination?*
- Regulatory – *Who? Is there a cleanup standard?*
- Financing - *Will anybody finance the assessment, remediation and construction of my project?*
- Time - *How long before I get closure? Before I can build?*
- Community – *NIMBY, density and other community issues?*

= *Stigma*

Emeryville History

- Industrial uses since 1920's
- Urban flight beginning 1970's
- Complicated regulatory environment since 1980's
- Perceived citywide groundwater contamination

→ *Stigma:*
no investors, no developers

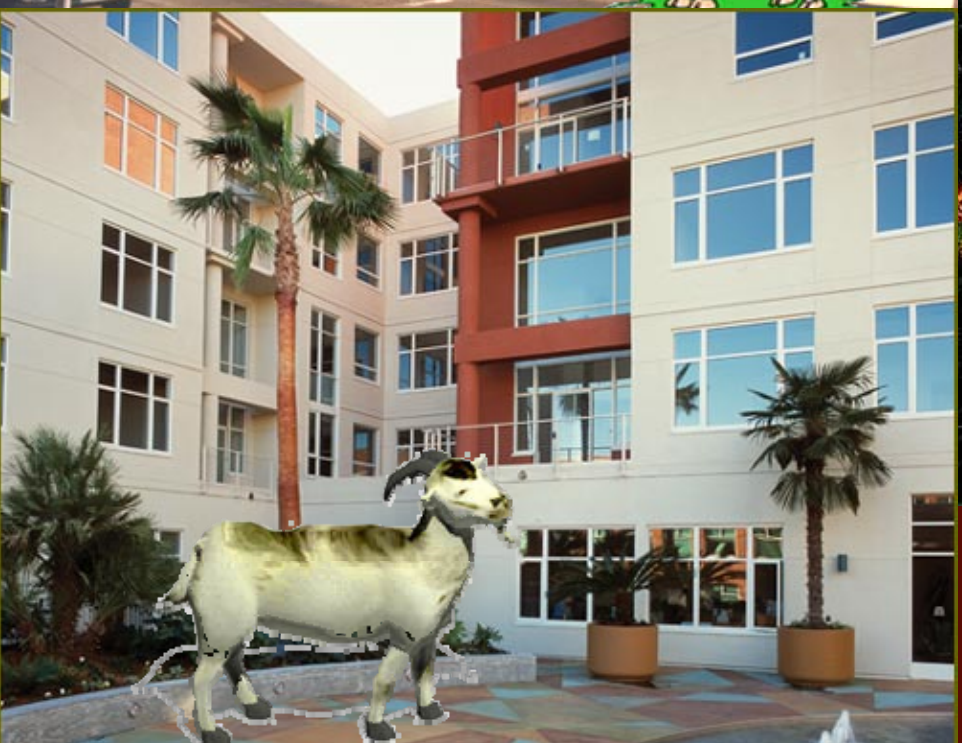

EMERYVILLE WAREHOUSE CO.

Residential Brownfield Redevelopment Challenges

- "Love Canal" & recent CA cases
- VOC issues
- Unclear Cleanup standards
- Lack of Institutional Controls and Long Term Stewardship
- Community Process
  - Stigma, NIMBY, Gentrification
- Zoning – Density and Infill
- Incremental cost
- Cities not staffed to redevelop or regulate
- Infrastructure and services

In spite of these challenges…

- Many redeveloped sites across California and the nation
- Lessons learned
- Benefit from more scientific information and remedial approaches
- Many models
  - Multi-family
  - Adaptive reuse
  - Mixed use
  - Medium Density
  - Single Family



But where's the beef?
Where's the grass?

Remediation Strategies in Fast Track Redevelopment

Citywide strategy

Site specific for Soil, Groundwater & Vapor

- Remove and dispose
- In-Situ & Ex-Situ
  - Chemical, Physical or Biologic treatment
- Limit exposure
  - Use controls
  - Engineering & institutional
- *Result: Capping and ICs*

Secondary Challenge

- Brownfields redevelopment had positive and negative results
  - Increased incomes and tax revenues
  - Environmental protection
  - New jobs, new residents
  - Local Services

  - *Reliance to paved parking lots and hardscape*
  - *Run-off, NPS pollution*
  - *Uneven urban design*
  - *Pedestrian unfriendly*
  - *Surface water concerns*

"Green" Goals

- Balance economic growth and environmental protection
- Storm water
  - Strategies to minimize pollution from surface runoff (C3 req'ts.)
  - Create *Guidelines for Green, Dense Redevelopment*
  - Enforcement mechanism
- Green Building
- Other policies
  - Parks & Open Space
  - Services

Green Building

- Green City Lofts
  - EPA RLF loan - $1.13M
  - Height variance
  - 62-units on 1+ acre
  - LEED-caliber
    - Sustainable materials
    - Radiant heat
    - Energy-star rated
- County Multi-family guidelines

Other Strategies

- Greenways and Parks
- Improved schools to attract families
- Center of Community Life
- Transit: Emery Go Round
- Land use: Transit Oriented Development
- Zoning:
  - Mixed uses
  - Density
  - Parking
- New General Plan

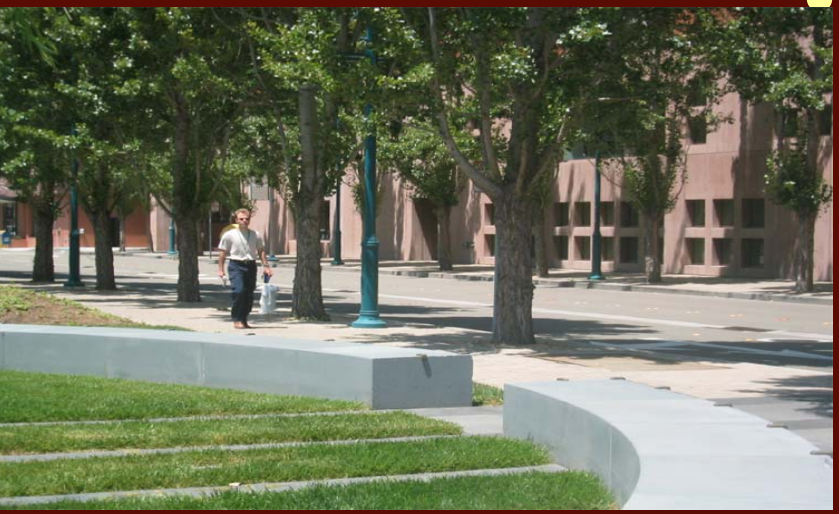
"Green, Dense Redevelopment"

- Background
  - Effects of sub/urbanization on surface waters
  - Traditional brownfields strategies
  - Emeryville context (geography, geology, climate, redevelopment, infrastructure)
- Integrating solutions and examples
  - Stormwater management (storage, infiltration, treatment, reuse)
  - Parking (shared, structured, programs)
  - Recreation & Green Space
  - Pedestrian and Bicycle Amenities
  - Traffic Calming
  - Habitat Protection & Creation
  - Energy Efficiency
  - Visual Interest and Aesthetics

Design Solution Descriptions

- Tree Preservation and Planting
- Green Roofs
- Water Storage and Harvesting
- Bio-Retention
- Bio-Filtration
- Infiltration
- Other Devices/ Programs

Tree Preservation and Planting



- Stormwater Functions
  - Intercept & hold rainwater
  - Absorb and transpire ground water
  - Remove & stabilize pollutants from stormwater
  - Shades & cools, reduces heat pollution
- Structural Soils
  - Artificial growing medium
  - Encourages root growth & satisfies pavement requirements
  - Works well on remediated sites that require new fill
  - Ideal for trees in parking lots, sidewalks & constrained spaces

Green Roofs

- Bird & insect habitat
- Aesthetic value
- Retrofit?
- Savings through reduced energy demand

- Extensive
  - Light, thin layer of planting medium & vegetation
  - Bio-Filtration, evapotranspiration- can intercept 10 to 100% of rain
  - Maintenance is minimal
  - Infrequent access
- Intensive
  - Bio-filtration, evapotranspiration of runoff
  - Open space or recreation facilities

Water Storage & Harvesting

- Cisterns
  - Collect and store rainwater for irrigation and other non-potable uses
  - Attenuate peak runoff flows
  - Conserve potable water
  - Above or below ground
  - Compatible with most roofing materials

Bio-Retention

- Rain Gardens
  - Utilize soil, plants, trees, hardscape for infiltration and bioremediation
  - Consists of grasssy buffer strip, sand bed, ponding area, organic/mulch laye, planting soil & plants.
  - Variety in plant types
  - Habitat and aesthetic value
  - Water table - 6 feet bgs
  - Unsuitable to residual contamination
- Drip-Line Planters
  - Suitable for contaminated sites- planter prevents exfiltration to underlying soils
  - Suitable for constrained spaces
  - Retrofit

Bio-Filtration

- Swales
  - May include trees, check dams in sloped areas
  - Various plant types
  - Curb treatments can be flexible
  - Allow appropriate “residence time” for water to be in contact with vegetation

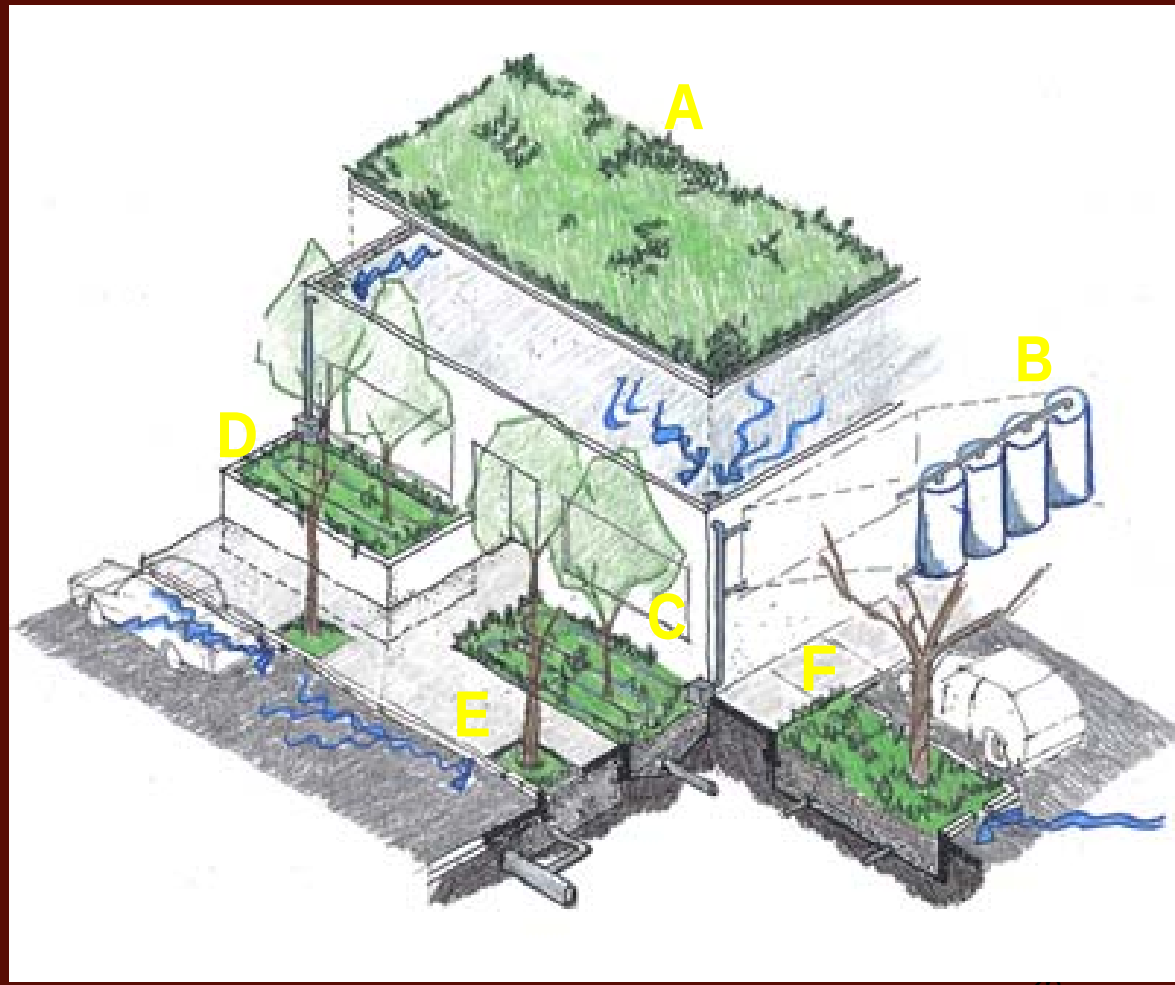
- Infiltration Trenches & basins
  - Collect storm water and slowly infiltrate or attenuate
  - Can employ filtering devices to pre-treat storm water
  - Can connect to existing storm sewer system
- Permeable Paving
  - Reduces amount of impervious surface
  - Appropriate for low-speed locations
  - Unsuitable to residual contamination

Infiltration

A “Tool Box” approach

Combined Solutions:

- Green Roof
- Cisterns
- Rainwater garden with drip line
- Drip-line planter
- Bio-retention treewell
- Infiltration basin



Sizing Worksheets

TABLE 1

Calculate Water Quality Volume

Designed to Capture 85% of runoff, based on Hydrological Data for Oakland WSO Airport (6335) - Alameda County, California

Roof

ID#	Description	Impervious Area (sq. ft)	Garden Area (sq. ft)	Total Area (sq. ft)	Roof "C"	Water Quality Volume (feet^3)	Water Quality Volume (gallons)	TREATMENT OPTIONS (gallons) Closed Cistern	TREATMENT OPTIONS (gallons) Irrigation/ Retention
	C=	0.85	0.15						
R1	Rooftop	2,000	500	**2,500**	*0.71*	115	859	0	859
R2	Rooftop	2,500	0	**2,500**	*0.85*	136	1,016	500	516
	TOTAL ROOF AREA	**5,000**			**TOTAL**	**251**	**1,875**	**TOTAL**	**500**	**1,375**

Site

ID#	Description	Impervious Area (feet^2)	Pervious Area [1] Flat	Pervious Area [1] Average (feet^2)	Pervious Area [1] Steep	Total (feet^2)	Parcel "C"	Water Quality Volume (feet^3)	Water Quality Volume (gallons)	TREATMENT OPTIONS Irrigation/Retention (sq.feet)	TREATMENT OPTIONS Swale	TREATMENT OPTIONS Bioretention	TREATMENT OPTIONS Other
	C=	0.85	0.15	0.2	0.3								
A1		8,000	100		500	**8,600**	*0.81*	444	3,324	8,600			
A2		1,000				**1,000**	*0.85*	54	406	1,000			
A3		150,000				**150,000**	*0.85*	8,150	60,966		150,000		
A4		3,000				**3,000**	*0.85*	163	1,219	3,000			
A5		25,000				**25,000**	*0.85*	1,358	10,161			25,000	
A6		76,150	100			**76,250**	*0.85*	4,143	30,991		76,250		
	TOTAL SITE/ROOF AREA							**268,850**	sq.feet				
	TOTAL SITE/ROOF WQ VOLUME							*(feet^3)* **14,564**	*(gallons)* **108,943**	**TOTAL BMP TREATMENT AREA**			**268,850**

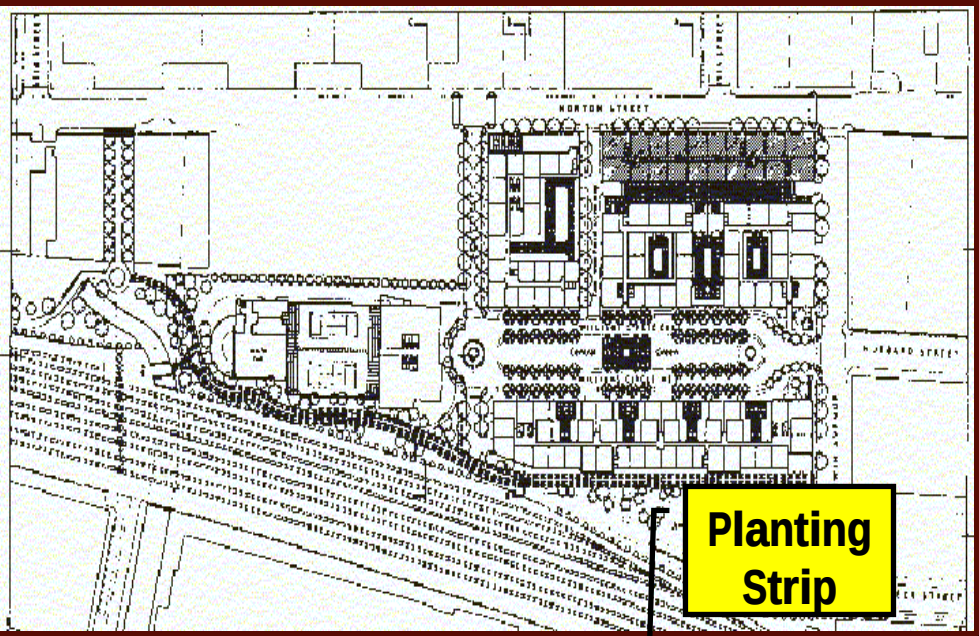
NOTES

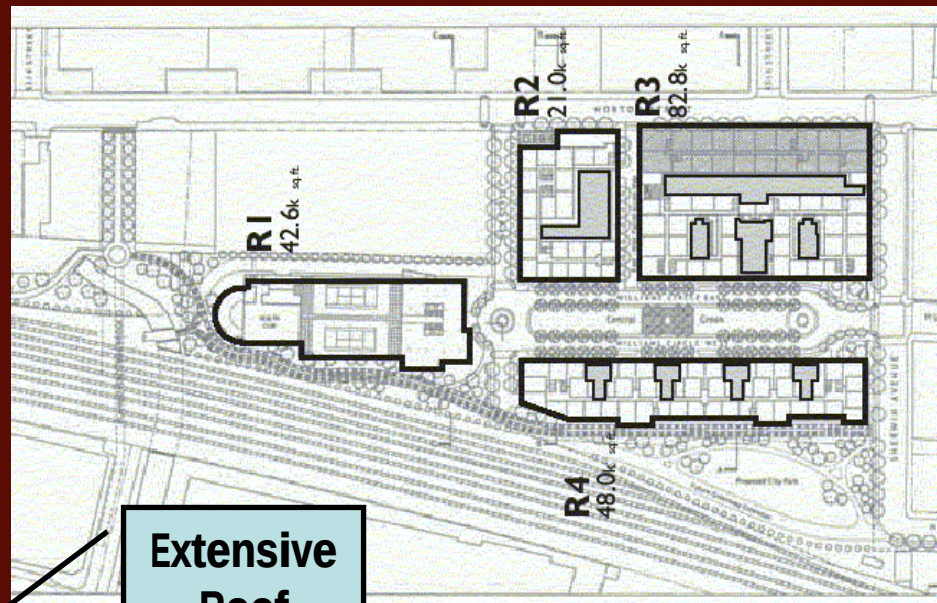
[1]

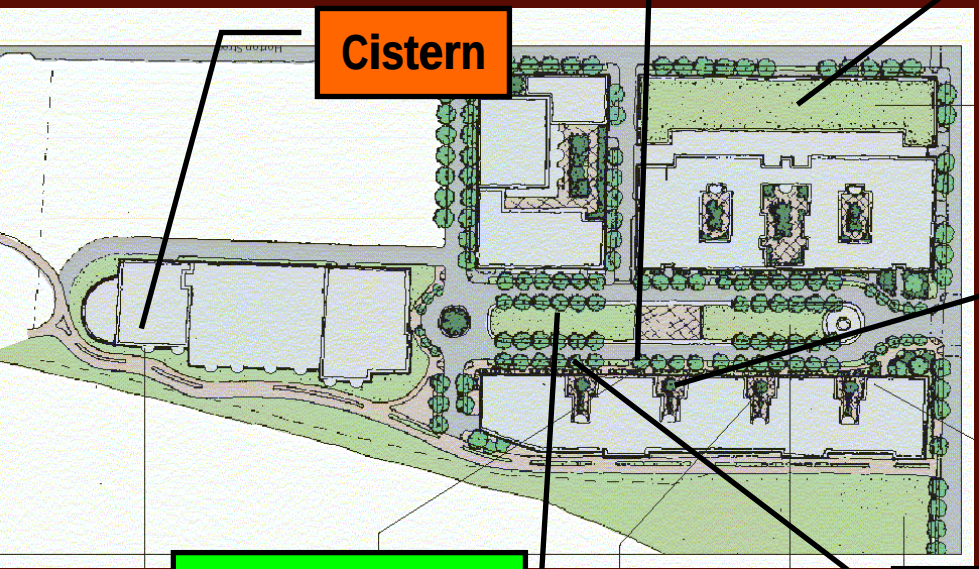
Pervious Area	Ground Slope
Flat	2% or Less
Average	2%-7%
Steep	Greater than 7%

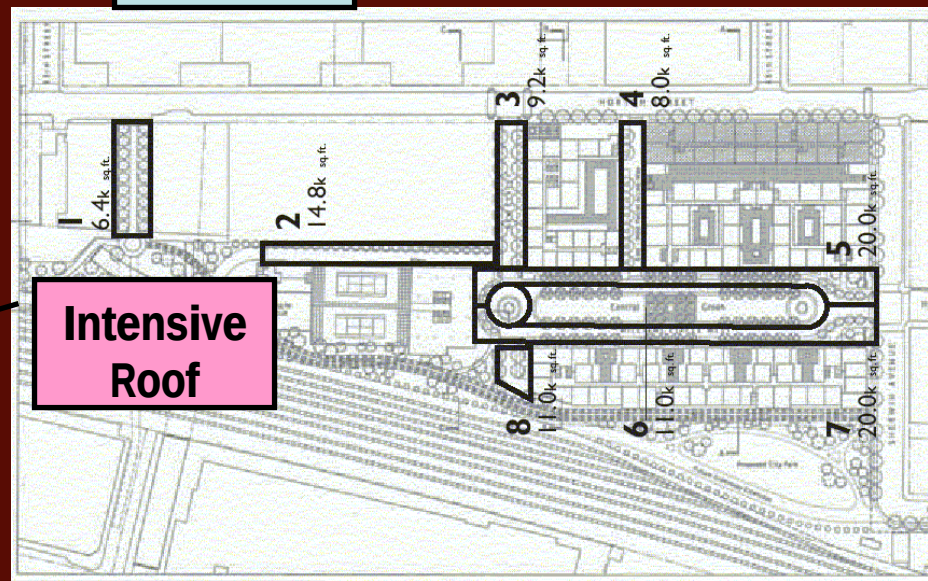
ALL AREA ACCOUNTED FOR


66th Street
Harris Street
65th Street
Peabody Lane









Bioremediation Planter

Implementation Issues

- Status
  - Adopted as guidelines
  - Cited in Zoning Ordinance
- Guidelines or requirements
- Mechanical systems
- Maintenance and Institutional Controls
- Educating developers
  - Technical Assistance
  - Financial assistance for early adapters
- Encouraging retrofit
- Approved projects
- Incompatible uses

Lessons

- Helps attain other sustainability goals
  - Urban design
  - Greening
  - Habitat
- Low developer resistance (after education)
- Study mechanical solutions and seek regulatory approval
- Solicit services from monitoring entity or obtain staff expertise and resources


Thank you!